



Food loss analysis: causes and solutions

Chickpea supply chain in India

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Chickpea (*Cicera rietinum*) known also as Bengal gram or chana is the third most important pulse crop accounting for around 20 percent of world production. It is a low-cost source of vegetarian protein. With the rise in income level in India, it is expected that the future demand for protein will increase. About 43.6 percent of chickpea farmers are smallholder and marginal with the crop contributing about 50 percent to their income. It is produced only once a year hence a crucial crop for small farmers.

ability and quality. Average storage period however, is 9 months. Weevil and rodent infestations are the common cause of loss during storage.

The low post-harvest losses in chickpea are due to the following: proximity of the farms to research institutions hence quick dissemination of technologies like new and improved varieties and latest agricultural machineries, threshing and pest management operations are carried out by service providers since farms are contiguous and the dominance of chickpea as a winter crop, availability of storage facilities that are close to the farms and are well-maintained, better support infrastructure like quality rural roads, and simple processing technologies.

The chickpea supply chain

Most of the trade is in the whole chickpea form hence assessment of the supply chain was done in the producing area of Ongole in Prakasam District of Andra Pradesh. Observations, direct interaction with the stakeholders in the chain and actual load tracking were done (only during storage) to provide an estimate of the quantitative and qualitative losses and identify the critical loss points in the chain.

Chickpea is a winter crop planted by farmers in mid-October to mid-December. The crop is harvested manually but threshing is done mechanically and packed in gunny bags. Farmers sell immediately to commission agents and seldom store their produce (Table 1). The traders serve as conduit of farmers to the wholesalers and processors assuring consistent supply of produce. The storage providers rent storage space to the traders. Farmers who store are given receipts which they can use as collaterals to avail

bank loans. Storage plays an important role in reducing losses and insuring availability of produce for processing. Chickpea is processed into value added products providing wide use of the products. The wholesalers sell to local retailers in packs of 25 to 50 kg.

Loss points in the supply chain

Losses in the chickpea supply chain were insignificant with quantitative loss in the range of 0.1 to 0.25 percent and qualitative loss of 0.25 to 1 percent (Table 1). The low losses were attributed mainly to the durable nature of the crop being a hard grain and the moisture content is lowered prior to storage. Loss during harvesting occurs only when it rains resulting in darkening of the seed coat and consequently low price. During storage in dry warehouse, moisture loss occurs due to uncontrolled environmental conditions. With cold storage (13-15oC), chickpea can be stored for 3 to 4 years without loss in vi-

Recommendations

Since chickpea is a durable crop, a significant number of farmers store the crop in their homes where weevil and rodent infestation occurs leading to grains with holes and broken grains. Moreover, rodents pose food safety risks. To address losses of farmers practicing home storage, capacity building on proper storage method should be done prior to harvesting. Farm level training will include identification and containment of pests, monitoring and sampling method, and maintenance of storage space.

Although the loss rate during storage is only 1.1 percent based on the average

TABLE 1
The chickpea supply chain, stakeholders, operations and loss points

Supply chain level	Production	→ Collection centre	→ Wholesale market Storage Processing	→ Retail market	→ Consumption
Stakeholders	Farmers	Assemblers Traders	Wholesalers Storage providers Processors	Retailers Millers	Consumers
Operations	Harvesting Threshing	Packaging Transport	Storage Processing	Retailing	Buying Consumption
Loss (%)					
Quantitative:	0.1	0.1	0.1	0.25	N/A
Qualitative:	N/A	N/A	1.0	0.25	N/A

TABLE 2
Budget calculation of capability building intervention

Item	Value/Unit
Product quantity	530 000 tonnes/yr
Product value	840 USD/tonne
Loss rate	1.1%
Food loss	5 830 tonnes/yr
Economic loss	4 897.200 USD/yr
Total cost of intervention	570 400 USD/yr
Client cost of intervention*	1.07 USD/tonne
Anticipated loss reduction	0.2%
Volume of loss reduction	1 060 tonnes/yr
Loss reduction savings	890 400 USD/yr
Profitability of the intervention	320 000 USD/yr

production volume of 530 000 tonnes per year in the district (Table 2), this translates to economic loss of USD 4 897.200 per year. The total yearly cost of the proposed training is USD 570,400 equivalent to client cost of USD 1.07 per tonne of chickpea. Because of the low losses, the anticipated loss reduction is also low at 0.2 percent hence the profitability of the solution is only USD 320 000 per year. Although the profitability of the proposed solution is low compared to the economy of the chickpea sector in Andhra Pradesh, the added benefits of capacity building include promotion of interaction between farmers and extension workers (trainers). Moreover, investment in capacity building positively impacts in the community since the effect of training is long lasting and brings about a sustained change in the community.

TABLE 3
Storage options available to the farmer

Parameter	Storage Options			
	No storage	Home storage	Cold storage	Normal dry storage
Quantity loss (%)	0	1	0	0.1
Quantity (tonne)	5.00	4.95	5.00	5.00
Qualitative impact on price (%)	-	-10	0	-1
Time impact on prices (%)	-	+10	+10	+10
Price (USD/tonne)	769	762	846	838
Additional storage cost (USD)	-	-	108	54
Total farmer revenue	3 846	3 770	4 123	4 130

Farmers seldom store in dry warehouse and cold storage facilities (Figure 1). They should be made aware of the different storage options available to them considering the price changes of chickpea after the harvest months of January to March. In some cases, a 50 percent increase in price occurs. Thus, it is in the best interest of the farmer to store the crop and wait for the price of chickpea to increase. Assuming that a farmer produces 5 tonnes of chickpea in a 2-hectare of land and with a 10 percent increase in price in late months after harvest, the farmer benefits if he practices either dry warehouse or cold storage (Table 3). Although dry warehouse storage will give slightly higher benefit, chickpea can be stored only for 9 to 12 months unlike the 3 to 4 years with cold storage with minimal deterioration. Multi-commodity cold storage facilities can be established in chickpea growing regions where farmers can store for a fee.

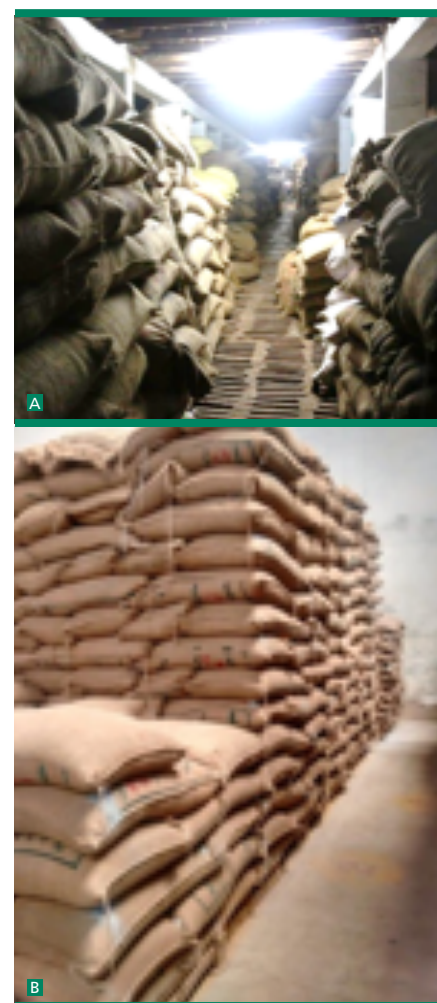


FIGURE 1
Dry warehouse (A) and cold storage (B) of chickpea

This information sheet summarizes the results of the study on Food Loss Analysis: Causes and Solutions, Case Studies in Small-scale Agriculture and Fisheries Subsectors of the Food and Agriculture Organization (FAO) of the United Nations. *For more information:* Global Initiative on Food Loss and Waste Reduction (www.fao.org/save-food).